MICHIGAN
DEPARTMENT OF NATURAL RESOURCES

Regional Headquarters
1990 South US-41
Marquette, MI 49855
October 3, 1986

Mr. Robert P. Ford
Forest Pest Management
USDA Forest Service
1992 Folwell Avenue
St. Paul, MN 55108

Dear Bob:

Here is our report for the Jack Pine Budworm Project funded by your office. Although initial population numbers appeared threatening in some areas, jack pine was only lightly defoliated in the worse areas. Our findings and thoughts on this years epidemic is included in the attached report.

I hope there is an opportunity to continue this study next year. There is much to learn. Relating insect surveys to resulting impact on jack pine, and correlating this with stand and site characteristics will greatly enhance our ability to properly manage our jack pine resource.

Let me know your thoughts on this years study and the possibilities of continuing the project for another year.

Sincerely,

Bob

Robert L. Heyd
Forest Pest Specialist

JACK PINE BUDWORM PHEROMONE

AN EVALUATION IN MICHIGAN

By Bob Cain

Jack pine stands, covering an estimated 317,400 acres of Michigan's Upper Peninsula, are an important source of fiber and a major component of recreational forest areas. Heaviest concentrations of jack pine are found in the central and eastern counties. Jack pine's chief value is as a pulpwood species. In 1978, 8,713,000 cu. ft. of jack pine was harvested. Over 91% of this, or 100,898 cords, was used for pulp. Jack pine saw logs yielding 3,900 mbf constituted most of the remainder. Fuelwood and poles comprised a very small percentage of the total.

The jack pine budworm (Choristoneura pinus) is the most serious pest of jack pine throughout the Lake States and adjoining parts of Canada. The insect is native to North America and will feed on most conifers growing in association with jack pine. All sizes of jack pine are attacked, but overmature, multi-storied, overstocked, and open grown stands or stands on poor sites suffer the most damage. Tree mortality, top-killing, and growth loss are commonly seen following outbreaks. Defoliation is also unsightly and camping and picnicing in recreation areas may be discouraged by large numbers of larvae dispersing on silk threads.

An outbreak in the early 1980's in northern lower Michigan resulted in the loss of approximately 350,000 cords of jack pine worth an estimated 3.5 million dollars. Drought and very poor site conditions intensified the losses by rendering stressed trees suseptible to attack by shoestring root rot and bark beetles. Poor market conditions at the time prevented the harvest of the badly damaged, poorly stocked stands. A large percentage of the overmature, well stocked stands with high mortality were salvaged. Average stumpage rates were 60% below normal for these stands.

In order to reduce the probability of future economic losses, knowledge of the budworm population trends and expected damage is essential. Surveys of budworm defoliation from the ground and from the air have been used to compare damage levels between stands, to evaluate the effectiveness of control measures, and to provide a rough idea of the expanse of an infestation. Budworm populations have been monitored in the pre-adult stages to detect building populations and predict damage levels. These surveys can be costly and time consuming and are not practical when budworm densities are very low. Monitoring the adult male population by using pheromone traps could overcome these problems. Canadian researchers have developed a synthetic sex attractant that mimics the pheromone of the jack pine budworm. Multi-pher plastic traps developed by CANUSA for monitoring the spruce budworm can be used to test the effectiveness of the newly developed jack pine budworm pheromone. If proven successful, this pheromone would allow managers to monitor a larger jack pine area more effectively. The presence of budworm could be detected much earlier, the number of budworm in different forest stands could be compared, and larval densities could be more accurately predicted. Subsequent surveys of pre-adult stages could then be conducted in those stands with high trap catches.

This study was designed to evaluate a pheromone - male trapping system for predicting the extent, intensity, and population changes of jack pine budworm on Michigan's Upper Peninsula during 1986 through 1989. Preliminary trapping was done in 1985 at or near the sites chosen for this study.

METHODS

Sixteen areas to be monitored with a synthetic jack pine budworm pheromone were chosen from eighteen forest stands where permanent jack pine budworm impact plots have been established. These impact plots were set up in 1984 and 1985 to define and develop risk-rating criteria and to assess the effects of defoliation on tree mortality, growth, and form. Impact plots were set in groups of three, with centers five chains apart and three chains in from the road. The information below was collected from the thirty trees closest to the plot center:

Plot Number
Tree Number
Tree Height
% Crown
Tree Position (Dominance)
General Condition of Tree/Crown
Defoliation Class
Basal Area

Defoliation class is an ocular estimate of the percent of foliage which has been damaged or lost. When trees suffer the loss of both new and old growth, damage increases considerably. A system of estimation and designation of defoliation on new and old growth was used. After careful examination with binoculars and with the unaided eye, individual trees were ranked according to the percentage missing new and old growth (Table 1).

Table 1. Classification of jack pine budworm defoliation.

Defoliation class	Defoliation class designation	Percent of new growth consumed	Percent of old growth consumed
Light	1	0 - 25	0
Moderate	2	26 - 75	0 - 25
Heavy	3	76 - 100	10 - 25
Severe	4	100	26 - 75
Extreme	5	100	75 - 100

Each impact plot area contains ninety trees -- 30 trees in three plots labelled A, B, and C. The locations of these plots are shown in figures 1 - 15. Data taken from impact plots is included in the Appendix.

The plot center of impact plot B in each area was used as a trap tree in the trapping plot. A trapping plot consists of three traps in a triangular configuration. Each leg of the triangle is approximately forty meters (two chains) long and all traps are least 40 meters from any roads or major openings in the forest. Trap locations are shown in figures 16 - 31. Each trap tree, from which a Multi-pher plastic trap was hung, was marked with orange paint. Two vertical lines were painted on the bole to indicate the direction of the other two trees in the plot.

Three standard concentrations, .3, .03, .003, of the pheromone developed by Canadian researchers were used to lure male budworms. Each trap in the trapping plot was baited with a different concentration of the pheromone. Traps were hung in marked trap trees 2 - 3 meters (6 -9 feet) above the ground and where possible 0.7 - 1 meters (2 - 3 feet) away from the tree trunk to permit free air flow and not obstruct trap openings.

Fortyeight traps were placed in the field during the first week of July and retrieved during the third week in August. Trap catches were small enough to be counted in the field. Numbers of male moths captured were recorded by plot and pheromone concentration.

An aerial survey of all the plots was flown in mid July. 35 mm pictures were taken of the plot areas and average defoliation within one mile of each of the plots was noted as follows:

< 20%	= light
21 - 50%	= moderate
> 50%	= heavy

A ground survey of defoliation was made in late July. Ten trees in each of the impact plots were carefully examined with binoculars and with the unaided eye. Individual trees were ranked according to the percentage of new foliage eaten as follows:

None	= no observable defoliation
< 20%	= light
21 - 50%	= moderate
> 50%	= heavy

In addition to the defoliation (damage) surveys, a number of pre-adult surveys were done in each of the impact plots where trapping plots were established. The first of these was an early larval survey conducted in early June. Thirty vegetative buds (shoots) and staminate cones (flowers) were examined from five trees at each plot and the number of tips with at least one larva was recorded. Wherever possible 15 shoots and 15 flower clusters were examined, however where staminate cones were not abundant more shoots were sampled. At the same time, a survey of flower abundance was conducted. The percent of branch tips with flowers was noted:

< 30% with flowers	= light
31 - 60%	= moderate
> 60%	= heavy

A late larval (5th and 6th instar) survey was conducted during the last week of June and the first week of July. Two 15-inch branch samples were taken from the mid-crown of each of three trees in each impact plot. Samples were collected in a basket attached to a pole pruner. The larvae were counted and a total for each tree was recorded. An average number of larvae per 15-inch branch was then determined.

From mid to late July pupal surveys were conducted in each of the plots. The time taken to collect pupae or pupal cases from the lower branches and uderstory trees was recorded. If five pupae were not found within five minutes of the recorded started time, sampling stopped. If five pupae were found within five minutes, examination continued until 25 pupae were found. Collected pupae were kept to determine the emergence rate of the adults and the abundance of budworm parasites and disease present.

An egg mass survey was conducted in the end of August. The same procedure was used as was for the late larval survey. However, branch samples were taken from the inner part of the crown closer to the trunk because windy weather during oviposition often forces females to remain protected within the crown (Dixon 1985). Egg masses were examined under a dissecting microscope and an average number of eggs per egg mass for each area was determined.

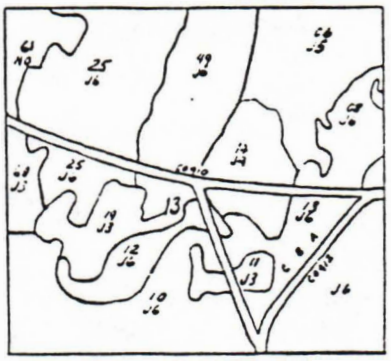


Fig. 1
JACK PINE BUDWORM IMPACT PLOT #1

LUCE COUNTY COMPARTMENT 30 STAND 13
T47N R13W S13

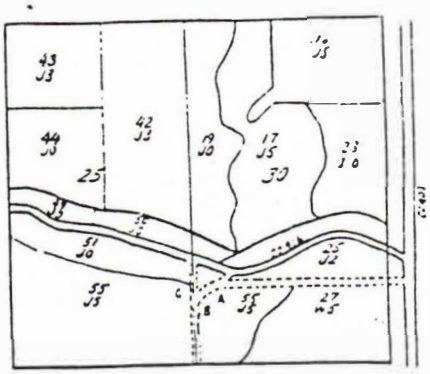


Fig. 2
JACK PINE BUDWORM IMPACT PLOT #2

LUCE COUNTY COMPARTMENT 19 STAND 55
T49N R11W S25 T49N R10W S30

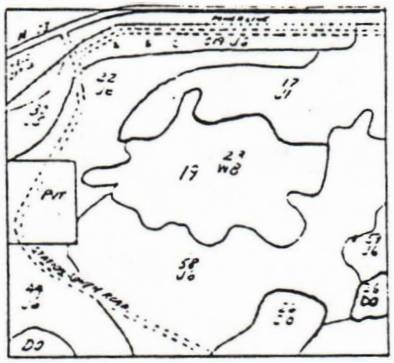


Fig. 3
JACK PINE BUDWORM IMPACT PLOT #3

CHIPPEWA COUNTY COMPARTMENT 65 STAND 13
T49N R6W S19

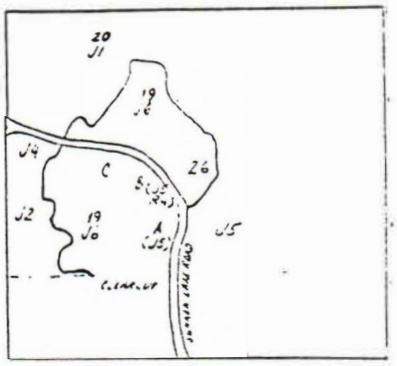


Fig. 4
JACK PINE BUDWORM IMPACT PLOT #4

SCHOOLCRAFT COUNTY COMPARTMENT 126 STAND 13
T47N R14W S26

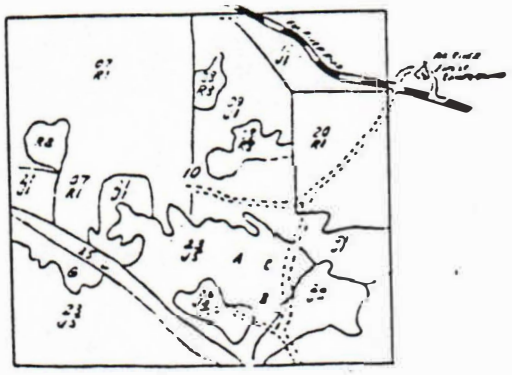


Fig. 5
JACK PINE BUDWORM IMPACT PLOT #5

SCHOOLCRAFT COUNTY COMPARTMENT 123 STAND 23
T46N R9W S10

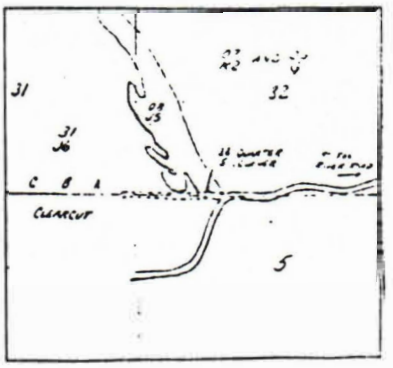


Fig. 6
JACK PINE BUDWORM IMPACT PLOT #6

SCHOOLCRAFT COUNTY COMPARTMENT 130 STAND 31
T49N R10W S31

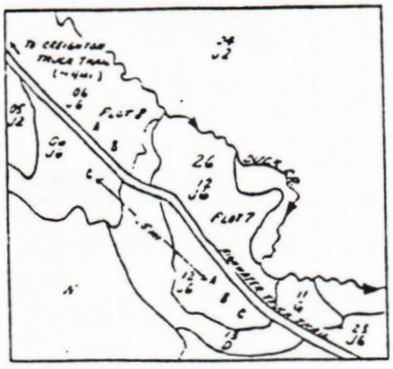


Fig. 7
Jack Pine Budworm Impact Plot #7 and Plot #8
Schoolcraft County Compartment 32 Stand 6 and Stand 12
T40N R15W S26

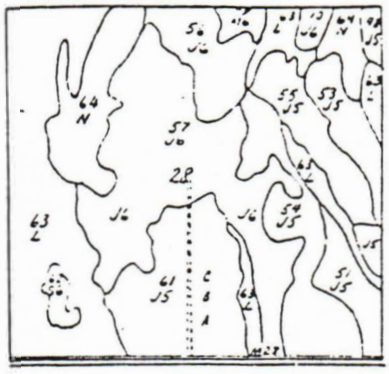


Fig. 8
Jack Pine Budworm Impact Plot #9
Schoolcraft County Compartment 157 Stand 61
T46N R16W S28

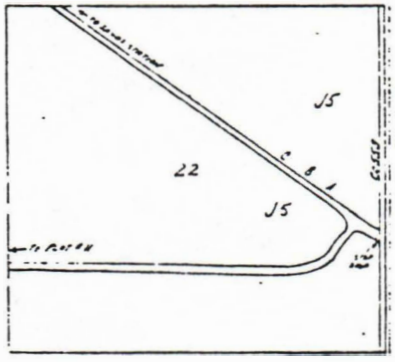


Fig. 9
Jack Pine Budworm Impact Plot #10
Marquette County Compartment 75 Stand 10
T46N R25W S22

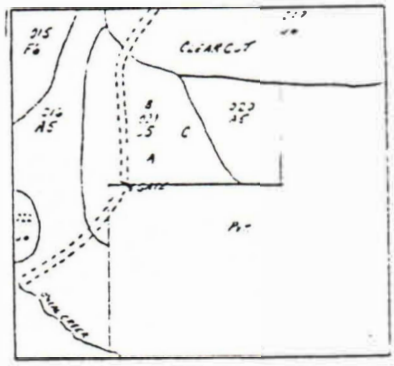


Fig. 10
Jack Pine Budworm Impact Plot #11
Marquette County Compartment 75 Stand 21
T46N R25W S29

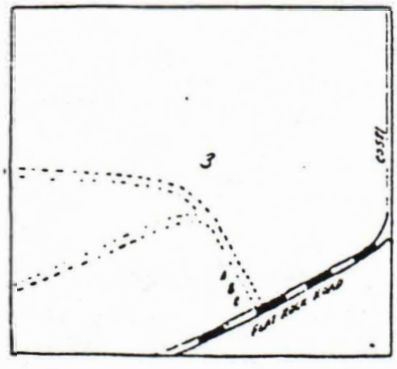


Fig. 11
Jack Pine Budworm Impact Plot #12
Marquette County Compartment 29 Stand 14
T45N R25W S3

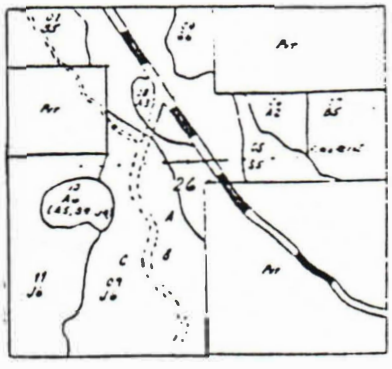


Fig 12
Jack Pine Budworm Impact Plot #13
Marquette County Compartment 25 Stand 9
T46N R24W S20

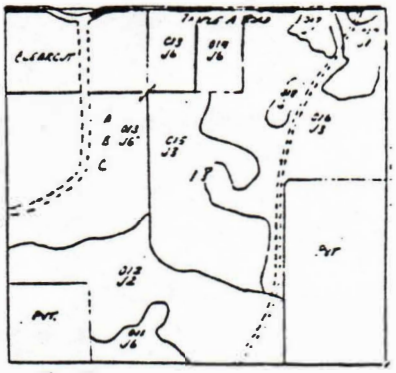


Fig. 13
Jack Pine Budworm Impact Plot # 14

Marquette County Compartment 6 Stand 43
T5GN R29W S18

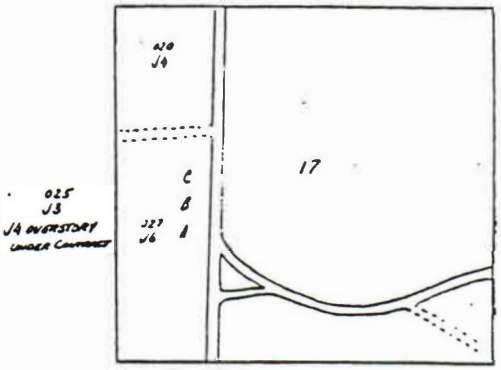


Fig. 14
Jack Pine Budworm Impact Plot # 15

Baraga County Compartment 8 Stand 27
T49N R34W S17

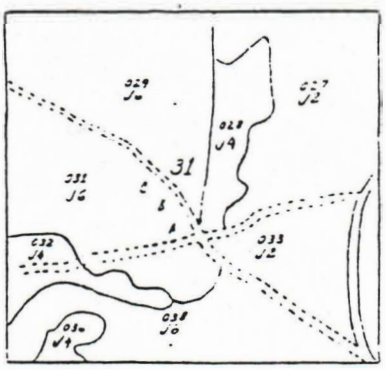
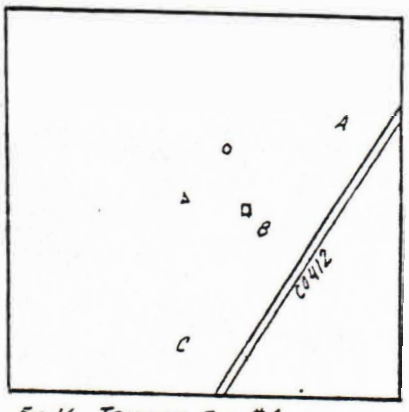


Fig. 15
Jack Pine Budworm Impact Plot # 16

Baraga County Compartment 12 Stand 31
T49N R34W S31



Δ = [.003]

□ = [.03]

o = [.3]

Fig. 16. TRAPPING PLOT #1

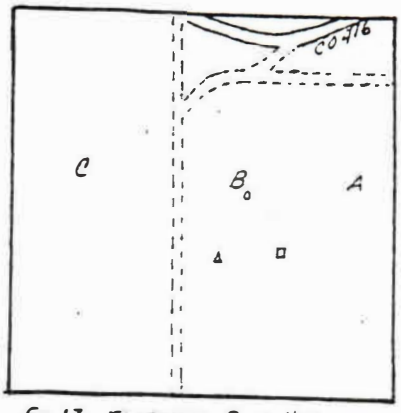


Fig. 17. TRAPPING PLOT #2

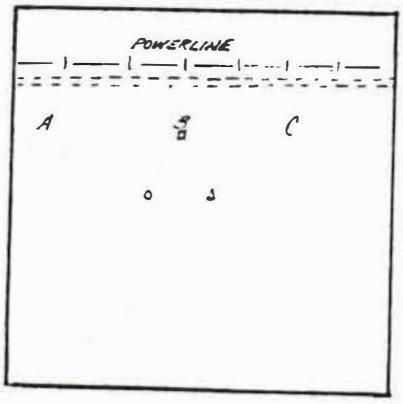


Fig. 18. TRAPPING PLOT #3

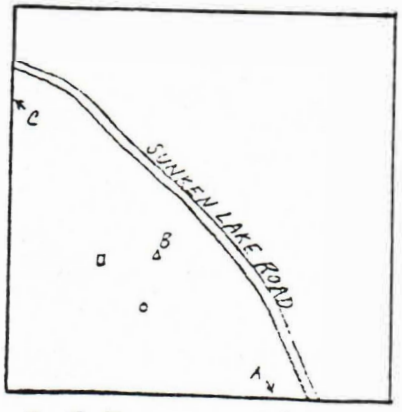


Fig. 19. TRAPPING PLOT #4

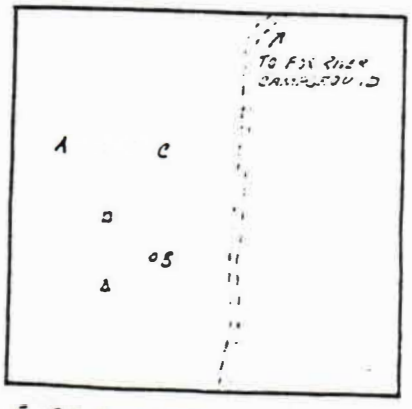
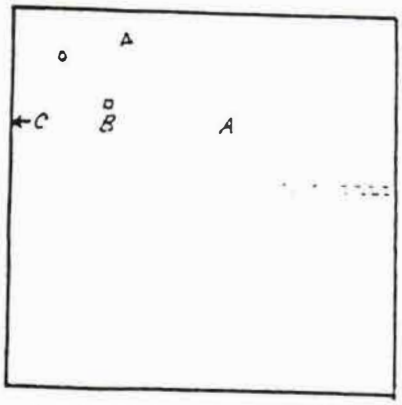


Fig. 20. TRAPPING PLOT #5



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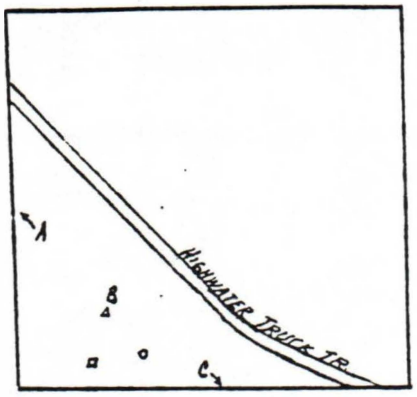
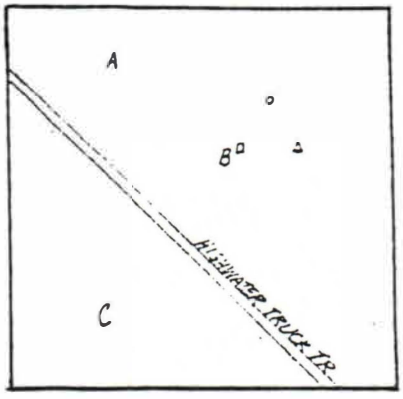


Fig. 22 TRAPPING PLOT # 7.



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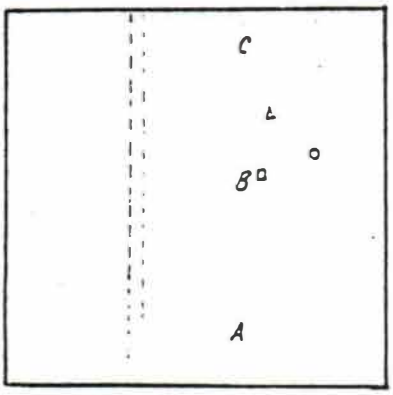

Fig. 24. TRAPPING PLOT # 9

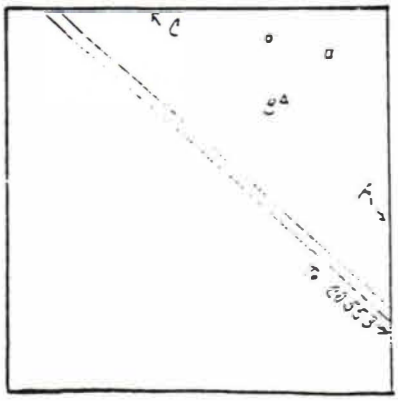

Fig 25. TRAPPING PLOT #10

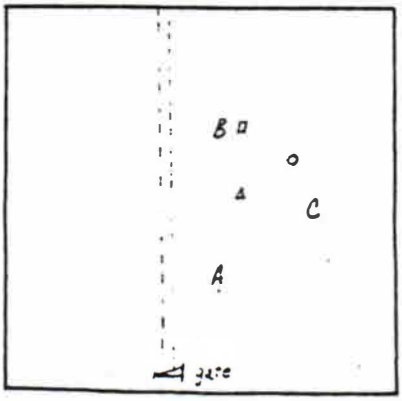

Fig. 26. TRAPPING PLOT # 11

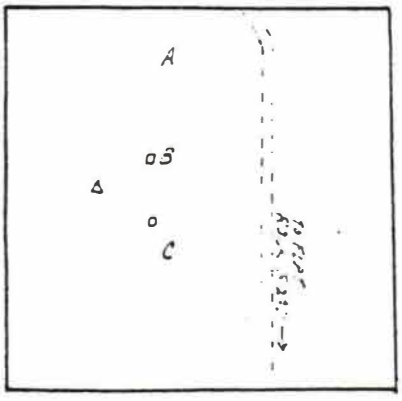

Fig. 27. TRAPPING PLOT # 12

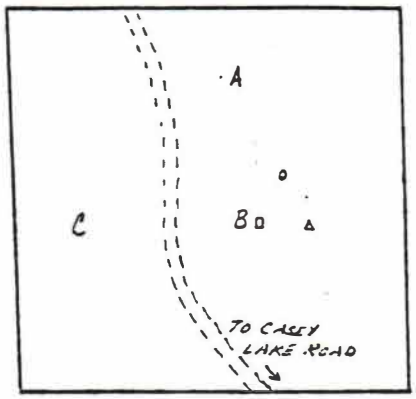

Fig. 28. TRAPPING PLOT # 13

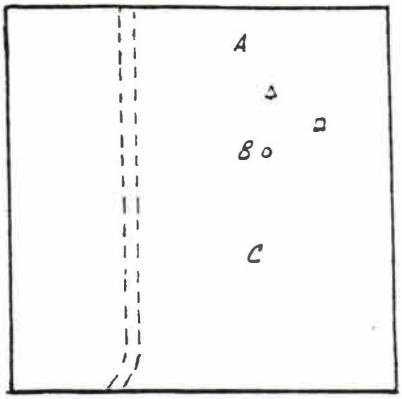

Fig 29. TRAPPING PLOT # 14

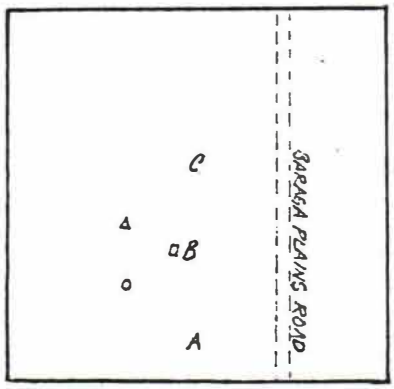

Fig. 30. TRAPPING PLOT # 15

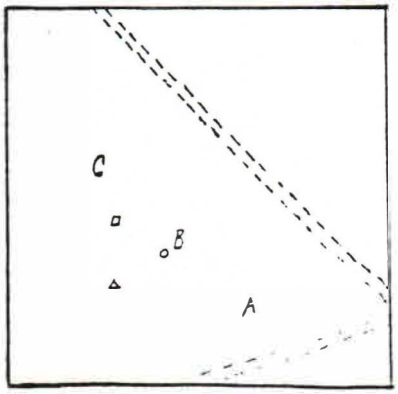

Fig 31. TRAPPING PLOT # 16

RESULTS

Pheromone trap catches and survey results are recorded on the forms provided by the U.S. Forest Service, Forest Insect and Disease Management in St. Paul, MN (see Appendix). A summary of trap catches listed by plot and pheromone concentration is provided in the table below. Trap catches recorded for 1985 were taken at or near the permanent trapping plots established in 1986. Table 4 presents the data from the jack pine flowering and pre-adult budworm surveys and Table 5 lists the ground and aerial defoliation survey results. Table 6 shows the condition of the pupae collected during the pupal survey.

Table 2. Pheromone trapping results for 1985 and 1986.

	1985			1986		
	Pheromone Concentration					
Plot No.	0.3	0.03	0.003	0.3	0.03	0.003
1	0	3	0	2	1	4
2	4	2	4	7	2	8
3	0	1	1	4	2	3
4	1	3	0	5	0	8
5	0	2	2	2	1	2
6	0	0	2	6	1	6
7	0	0	3	2	0	1
8	0	0	1	1	1	1
9	0	4	3	2	2	1
10	0	1	0	50	15	11
11	0	1	2	1	0	0
12	0	4	4	20	5	8
13	0	0	0	6	0	1
14	5	5	19	0	0	0
15	0	1	1	11	12	10
16	0	1	0	5	2	2
Totals:	10	28	42	124	44	66

Table 3. Differences between 1986 and 1985 trap catches.

Plot No.	0.3	0.03	0.003
1	2	-2	4
2	3	0	4
3	4	1	2
4	4	-3	[illegible]
5	2	-1	0
6	6	1	4
7	2	0	-2
8	1	1	0
9	2	-2	-2
10	50	14	11
11	1	-1	-2
12	20	1	4
13	6	0	1
14	-5	-5	-19
15	11	11	9
16	5	1	2
Totals:	114	16	24

Table 4. Jack pine flowering and pre-adult jack pine budworm survey results for 1986.

Plot No.	Flower Abundance	Early Larvae	Late Larvae	Pupae	Egg Mass	Ave. No. eggs/mass
1	Moderate	0.0	0.0	1.0	0.0	-
2	Heavy	0.2	0.4	1.0	0.0	-
3	Moderate	8.0	0.6	35min	0.2	91
4	Light	12.0	1.2	30min	0.3	75
5	Light	13.6	0.4	20min	0.2	55
6	Light	12.3	0.9	2.0	0.0	-
7	Light	10.3	0.1	1.3	0.0	-
8	Light	6.7	0.1	0.7	0.0	-
9	Moderate	3.3	0.7	0.3	0.0	-
10	Moderate	2.0	0.4	1.0	0.0	-
11	Light	0.3	0.1	0.0	0.0	-
12	Heavy	2.3	1.2	1.0	0.0	-
13	Moderate	0.0	0.1	0.0	0.0	-
14	Light	0.7	0.2	0.0	0.0	-
15	Moderate	13.3	4.6	7min	2.5	77
16	Moderate	12.0	4.0	6min	0.7	80

Table 5. Ground and aerial defoliation survey results.

Plot No.	Aerial	Ground
1	Light	None
2	Light	None
3	Light	Light
4	Light	Light
5	Light	Light
6	Light	Light
7	Light	Light
8	Light	Light
9	Light	None
10	Light	Light
11	Light	None
12	Light	Light
13	Light	Light
14	Light	None
15	Light	Moderate
16	Light	Light

TABLE 6. CONDITION OF COLLECTED PUPAE.

PLOT NO.	TOTAL COLLECTED	# EMERGED	# PARASITIZED	# OTHER (DISEASED)
3	25	25	0	0
4	25	16	6	3
5	25	19	2	4
15	75	56	10	9
16	75	60	8	7
TOTALS:	225	176	26	23

Discussion

Pheromone trap catches do not appear to be strongly related to pheromone concentration. Traps set in 1985 showed higher catches with the weakest pheromone concentration. In 1986, the highest concentration appeared to be most effective in catching male moths - this was most evident in plots 10 and 12. Within several of the plots, trap location may account for catch differences. The 0.03 concentration on plot 3 was placed in a protected area on the bottom of a slope. Reduced air flow in this area may have made this trap less effective than those placed higher on the slope. In plot 4, the

0.03 concentration was placed in a jack pine bordered on two sides by red pine. The presense of red pine appears to have reduced the pheromone's effectiveness considerably. Similarly, hardwoods growing in plot 13 may have inhibited the 0.03 concentration's attraction.

Trap catches in 1985 proved to be a fair indicator of the 1986 budworm population. Catches were relatively low in all trapping areas and 1986 budworm populations were down across most of the Upper Peninsula. However, a building population in the Baraga Plains (plots 15 and 16) where moderate defoliation was observed in 1986 was not detected in 1985. Also, a seemingly significant 1985 trap catch in the Yellowdog Plains (plot 15) did not develop into a significant 1986 budworm population.

Trap catches in 1986 are difficult to interpret. Moth catches in the Baraga Plains where defoliation was evident and adult moth emergence was obvious were not much higher than non defoliated areas and considerably lower than plots 10 and 12. Overall, trap catches were again low and it is interesting to note that trapping plots within several miles of plot 10 and plot 12 had very low moth catches.

Jack pine flower abundance may be a good indicator of the success of an existing budworm population, however a heavy flower crop is not indicative of a high population. It is best used to interpret the results of the early larvae survey. In areas previously defoliated (plots 4 through 8) flower production was significantly reduced. Early larvae were concentrated in the few flower clusters available, resulting in higher larvae counts than in areas with perhaps equal populations but greater flower abundance.

The late larvae survey is the most accurate predictor of the severity of defoliation. Care must be taken when collecting branch samples not to disturb the budworm before the sample is secure in the collecting basket. This survey also provides insights into the the condition of the population. Parasites and disease were common in both the declining population in Schoolcraft County (plots 4 through 8) and in the building population in Baraga County (plots 15 and 16). This was looked at more closely in the pupal survey.

The pupal survey was quickly and easily done. Results were similar to the late larvae survey. Parasitism and disease combined killed 22% of the 225 pupae collected in five plots. In Schoolcraft County 30% of the pupae suffered mortality as did 23% in Baraga County. Tachinid fly larvae appeared to be the most common parasite in both areas.

Egg mass surveys were time consuming and provided little additional insight to the information collected in previous surveys. The most egg masses found were in plots 15 and 16 on the Baraga plains. No egg masses were found on either plots 10 or 12 where pheromone trap catches were highest.

Aerial survey revealed no budworm activity in any major jack pine area in the Upper Peninsula. No crown scorch was evident even in the Baraga Plains where moderate defoliation could be seen from the ground. Rainy and windy weather during the late larval period may have removed most of the clipped needles before "scorch" could occur. Ground surveys and late larvae surveys also revealed that where flowers were abundant many larvae continued to feed on pollen and did little damage to the new growth.

Literature Cited

Dixon,J.C. 1985. Jack pine budworm surveys: Forest insect and disease survey methods manual/M.A.6. U.S.D.A. For. Serv. Sec. 3.1.3: 18 pp.

Appendix A

Survey Forms

JACK PINE BUDWORM PHEROMONE TRAPPING

Cooperator: HEYD/CAIN State: MI District: NEWBERRY Plot Number: 1
Timber Type: J-6 Township: T49N Range: R10W Section: 13 Forty: ____
County: LUCE Location: SW 1E CO412 AND CO410 INTERSECTION
Compartment: 30 Stand: 13 Ownership: STATE

Data to provide if available:

	1985	1986	1987	1988	1989	1990
date placed	7/15	7/8				
date collected	8/14	8/12				
NUMBER OF 0.3%	0	2				
MOTHS 0.03%	3	1				
TRAPPED 0.003%	0	4				
early larval	____	0				
late larval	____	0				
pupae	____	1				
egg mass	____	2				
ground defoliation	____	NONE				
aerial defoliation	____	LIGHT				

Fmt 1 Updating Rec Type changes & F1 to Update. (F11 Omits) FES 2.01

FLOWER ABUNDANCE = MODERATE YEAR OF ORIGIN = 1931

EARLY LARVAL = AVE. # PER 30 SHOOTS AND FLOWERS
LATE LARVAL = AVE. # PER 15-INCH BRANCH SAMPLE
PUPAE = AVE. # COLLECTED IN 5 MIN OR TIME TAKEN TO COLLECT 25
EGG MASS = AVE # PER 15-INCH BRANCH SAMPLE.

JACK PINE BUDWORM PHEROMONE TRAPPING

Cooperator: HEYD/CAIN State: MI District: NEWBERRY Plot Number: 2
Timber Type: J5 Township: T49N Range: R10W Section: 30 Forty: ____
County: LUCE Location: APPROX. 1/2 MI WEST OF CO407, JUST SOUTH OF CO416
Compartment: 19 Stand: 55 Ownership: STATE

Data to provide if available:

	1985	1986	1987	1988	1989	1990
date placed	7/15	7/8				
date collected	8/14	8/12				
NUMBER OF 0.3%	4	7				
MOTHS 0.03%	2	2				
TRAPPED 0.003%	4	8				
early larval	____	0.2				
late larval	____	0.4				
pupae	____	1				
egg mass	____	0				
ground defoliation	____	NONE				
aerial defoliation	____	LIGHT				

Fmt 1 Updating Rec Type changes & F1 to Update. (F11 Omits) FES 2.01

FLOWER ABUNDANCE = HEAVY YEAR OF ORIGIN = 1940

JACK PINE BUDWORM PHEROMONE TRAPPING

Cooperator: HEYD/CAIN State: MI District: NEWBERRY Plot Number: 3
Timber Type: J6 Township: T~~47N~~ 49N Range: R~~7W~~ 6W Section: ~~2~~ 19 Forty: ____
County: LUCE Location: SOUTH OF POWERLINE ROAD OFF SOUTH STATION RD.
Compartment: ~~25~~ 65 Stand: 19 Ownership: STATE

Data to provide if available:

		1985	1986	1987	1988	1989	1990
date placed		7/15	7/8				
date collected		8/14	8/12				
NUMBER OF	0.3%	0	4				
MOTHS	0.03%	1	2				
TRAPPED	0.003%	1	3				
early larval		____	8				
late larval		____	0.6				
pupae		____	35 MIN				
egg mass		____	0.2				
ground defoliation		____	LIGHT				
aerial defoliation		____	LIGHT				

Fmt 1 Updating Rec Type changes & F1 to Update. (F11 Omits) FES 2.01

FLOWER ABUNDANCE = MODERATE

NOTE LOCATION CHANGE

JACK PINE BUDWORM PHEROMONE TRAPPING

Cooperator: HEYD/CAIN State: MI District: SHINGLETON Plot Number: 4
Timber Type: J6 Township: T47N Range: R14W Section: 25 Forty: ____
County: SCHOOLCRAFT Location: WEST OF SEARCH TRAIL
Compartment: 126 Stand: 19 Ownership: STATE

Data to provide if available:

		1985	1986	1987	1988	1989	1990
date placed		7/15	7/7				
date collected		8/14	8/12				
NUMBER OF	0.3%	1	5				
MOTHS	0.03%	3	0				
TRAPPED	0.003%	0	8				
early larval		____	12				
late larval		____	1.2				
pupae		____	30 MIN				
egg mass		____	0.3				
ground defoliation		____	LIGHT				
aerial defoliation		____	LIGHT				

Fmt 1 Updating Rec Type changes & F1 to Update. (F11 Omits) FES 2.01

FLOWER ABUNDANCE = LIGHT

NEAR OF SEARCH TRAIL

JACK PINE BUDWORM PHEROMONE TRAPPING

Cooperator: HEYD/CAIN_ State: MI District: SHINGLETON_____ Plot Number: 5
Timber Type: __J5_____ Township: T46N_ Range: R14W_ Section: 10 Forty: ____
County: SCHOOLCRAFT_____ Location: ½ MILE WEST OF CAMPGROUND_____
Compartment: 123__ Stand: 23___ Ownership: STATE_____

Data to provide if available:

	1985	1986	1987	1988	1989	1990
date placed	7/15	7/7				
date collected	8/14	8/19				
NUMBER OF 0.3%	0	2				
MOTHS 0.03%	2	1				
TRAPPED 0.003%	2	2				
early larval	_____	13.6				
late larval	_____	0.4				
pupae	_____	20 MIN				
egg mass	_____	0.2				
ground defoliation	_____	LIGHT				
aerial defoliation	_____	LIGHT				

Fmt 1 Updating Rec Type changes & F1 to Update. (F11 Omits) FES 2.01

FLOWER ABUNDANCE = LIGHT YEAR OF ORIGIN = 1921

JACK PINE BUDWORM PHEROMONE TRAPPING

Cooperator: HEYD/CAIN_ State: MI District: [illegible] Plot Number: 5
Timber Type: ___16_____ Township: T46N_ Range: R14W_ Section: 31 Forty: ____
County: SCHOOLCRAFT_____ Location: _____
Compartment: 123__ Stand: 37___ Ownership: _____

Data to provide if available:

	1985	1986	1987	1988	1989	1990
date placed	7/15	7/7				
date collected	8/14	8/19				
NUMBER OF 0.3%	0	6				
MOTHS 0.03%	0	1				
TRAPPED 0.003%	2	6				
early larval	_____	12.3				
late larval	_____	0.9				
pupae	_____	2				
egg mass	_____	0				
ground defoliation	_____	LIGHT				
aerial defoliation	_____	LIGHT				

Fmt 1 Updating Rec Type changes & F1 to Update. (F11 Omits) FES 2.01

FLOWER ABUNDANCE = LIGHT YEAR OF ORIGIN = 1921

NOTE SECTION CORRECTION

JACK PINE BUDWORM PHEROMONE TRAPPING

Cooperator: HEYD/CAIN_ State: MI District: SHINGLETON_____ Plot Number: 7
Timber Type: _J6_____ Township: T44N_ Range: R15W_ Section: 26 Forty: ____
County: SCHOOLCRAFT_____ Location: WEST OF HIGHWATER TOWER TRAIL_____
Compartment: 32___ Stand: 12___ Ownership: STATE_____

Data to provide if available:

	1985	1986	1987	1988	1989	1990
date placed	7/15	7/7				
date collected	8/14	8/19				
NUMBER OF 0.3%	0	2				
MOTHS 0.03%	0	0				
TRAPPED 0.003%	3	1				
early larval	_____	10.3				
late larval	_____	0.1				
pupae	_____	1.3				
egg mass	_____	0				
ground defoliation	_____	LIGHT				
aerial defoliation	_____	LIGHT				

Fmt 1 Updating Rec Type changes & F1 to Update. (F11 Omits) FES 2.01

FLOWER ABUNDANCE = LIGHT YEAR OF ORIGIN: 1934

JACK PINE BUDWORM PHEROMONE TRAPPING

Cooperator: HEYD/CAIN_ State: MI District: SHINGLETON_____ Plot Number: 8
Timber Type: _J6_____ Township: T44N_ Range: R15W_ Section: 26 Forty: ____
County: SCHOOLCRAFT_____ Location: EAST OF HIGHWATER TOWER TRAIL_____
Compartment: 32___ Stand: 6____ Ownership: STATE_____

Data to provide if available:

	1985	1986	1987	1988	1989	1990
date placed	7/15	7/7				
date collected	8/14	8/19				
NUMBER OF 0.3%	0	1				
MOTHS 0.03%	0	1				
TRAPPED 0.003%	1	1				
early larval	_____	6.7				
late larval	_____	0.1				
pupae	_____	0.7				
egg mass	_____	0				
ground defoliation	_____	LIGHT				
aerial defoliation	_____	LIGHT				

Fmt 1 Updating Rec Type changes & F1 to Update. (F11 Omits) FES 2.01

FLOWER ABUNDANCE = LIGHT YEAR OF ORIGIN = 1934

JACK PINE BUDWORM PHEROMONE TRAPPING

Cooperator: HEYD/CAIN_ State: MI District: SHINGLETON_____ Plot Number: 9
Timber Type: ___J5_____ Township: T46N_ Range: R16W_ Section: 28 Forty: ____
County: SCHOOLCRAFT_____ Location: NORTH_OF_M28_____
Compartment: 157__ Stand: 61___ Ownership: STATE_____

Data to provide if available:

	1985	1986	1987	1988	1989	1990
date placed	7/15	7/7				
date collected	8/14	8/19				
NUMBER OF 0.3%	0	2				
MOTHS 0.03%	4	2				
TRAPPED 0.003%	3	1				
early larval	_____	3.3				
late larval	_____	0.7				
pupae	_____	0.3				
egg mass	_____	0				
ground defoliation	_____	NONE				
aerial defoliation	_____	LIGHT				

Fmt 1 Updating Rec Type changes & F1 to Update. (F11 Omits) FES 2.01

FLOWER ABUNDANCE = MODERATE YEAR OF ORIGIN =

JACK PINE BUDWORM PHEROMONE TRAPPING

Cooperator: HEYD/CAIN_ State: MI District: GWINN_____ Plot Number: 10
Timber Type: ___J5_____ Township: T46N_ Range: R23W_ Section: 15 Forty: ____
County: MARQUETTE_____ Location: WEST_OF_CHAMPION_____
Compartment: 75___ Stand: 10___ Ownership: MARQUETTE_COUNTY_____

Data to provide if available:

	1985	1986	1987	1988	1989	1990
date placed	7/15	7/3				
date collected	8/14	8/21				
NUMBER OF 0.3%	0	50				
MOTHS 0.03%	1	15				
TRAPPED 0.003%	0	11				
early larval	_____	2				
late larval	_____	0.4				
pupae	_____	1				
egg mass	_____	0				
ground defoliation	_____	LIGHT				
aerial defoliation	_____	LIGHT				

Fmt 1 Updating Rec Type changes & F1 to Update. (F11 Omits) FES 2.01

FLOWER ABUNDANCE = MODERATE YEAR OF ORIGIN = 1913

JACK PINE BUDWORM PHEROMONE TRAPPING

Cooperator: HEYD/LAIN_ State: MI District: GWINN_____ Plot Number: 11
Timber Type: ___J5_____ Township: T46N_ Range: R25W_ Section: 29 Forty: ____
County: MARQUETTE_____ Location: _____
Compartment: 79___ Stand: 21___ Ownership: STATE_____

Data to provide if available:

		1985	1986	1987	1988	1989	1990
date placed		7/15	7/3				
date collected		8/14	8/21				
NUMBER OF MOTHS TRAPPED	0.3%	0	1				
	0.03%	1	0				
	0.003%	2	0				
early larval		_____	0.3				
late larval		_____	0.1				
pupae		_____	0				
egg mass		_____	_____				
ground defoliation		_____	NONE				
aerial defoliation		_____	LIGHT				

Fmt 1 Updating Rec Type changes & F1 to Update. (F11 Omits) FES 2.01

FLOWER ABUNDANCE : LIGHT YEAR OF ORIGIN: 1989

JACK PINE BUDWORM PHEROMONE TRAPPING

Cooperator: HEYD/LAIN State: MI District: [illegible] Plot Number: 12
Timber Type: __J5_____ Township: T46N_ Range: R25W_ Section: 3 Forty: ____
County: MARQUETTE_____ Location: NORTH OF EAST SIDE CLUB_____
Compartment: 29___ Stand: 14___ Ownership: STATE_____

Data to provide if available:

		1985	1986	1987	1988	1989	1990
date placed		7/15	7/3				
date collected		8/14	8/21				
NUMBER OF MOTHS TRAPPED	0.3%	0	20				
	0.03%	4	5				
	0.003%	4	8				
early larval		_____	2.3				
late larval		_____	1.2				
pupae		_____	1				
egg mass		_____	0				
ground defoliation		_____	LIGHT				
aerial defoliation		_____	LIGHT				

Fmt 1 Updating Rec Type changes & F1 to Update. (F11 Omits) FES 2.01

FLOWER ABUNDANCE : HEAVY YEAR OF ORIGIN: 1989

JACK PINE BUDWORM PHEROMONE TRAPPING

Cooperator: HEYD/CAIN_ State: MI District: ISHPEMING_____ Plot Number: 13
Timber Type: ___J6_____ Township: T46N_ Range: R28W 29W Section: 2926 Forty: ____
County: MARQUETTE_____ Location: ON ROAD CONNECTING PEDDLER LAKE RD & CASEY LAKE RD
Compartment: 25___ Stand: _9___ Ownership: STATE_____

Data to provide if available:

	1985	1986	1987	1988	1989	1990
date placed	7/15	7/3				
date collected	8/14	8/21				
NUMBER OF 0.3%	0	6				
MOTHS 0.03%	0	0				
TRAPPED 0.003%	0	1				
early larval	_____	0				
late larval	_____	0				
pupae	_____	0				
egg mass	_____	0				
ground defoliation	_____	LIGHT				
aerial defoliation	_____	LIGHT				

Fmt 1 Updating Rec Type changes & F1 to Update. (F11 Omits) FES 2.01

FLOWER ABUNDANCE = MODERATE

NOTE RANGE AND SECTION CORRECTION

JACK PINE BUDWORM PHEROMONE TRAPPING

Cooperator: HEYD/CAIN_ State: MI District: ISHPEMING____ Plot Number: 14
Timber Type: ___J6_____ Township: T50N_ Range: R29W_ Section: 13 Forty: ____
County: MARQUETTE_____ Location: EAST OF YELLOWDOG ROAD_____
Compartment: 6____ Stand: 13___ Ownership: STATE_____

Data to provide if available:

	1985	1986	1987	1988	1989	1990
date placed	7/15	7/2				
date collected	8/14	8/21				
NUMBER OF 0.3%	5	0				
MOTHS 0.03%	5	0 (BEAR TAMPERED)				
TRAPPED 0.003%	19	0 .				
early larval	_____	0.7				
late larval	_____	0.2				
pupae	_____	0				
egg mass	_____	0				
ground defoliation	_____	NONE				
aerial defoliation	_____	LIGHT				

Fmt 1 Updating Rec Type changes & F1 to Update. (F11 Omits) FES 2.01

FLOWER ABUNDANCE : LIGHT

JACK PINE BUDWORM PHEROMONE TRAPPING

Cooperator: HEYD/LAIN_ State: MI District: BARAGA_____ Plot Number: 15
Timber Type: __J6_____ Township: T49N_ Range: R34W_ Section: 17 Forty: ____
County: BARAGA_____ Location: WEST OF TRUCK TRAIL ROAD AND PLAINS TRAIL INTERSECTION
Compartment: 8____ Stand: 27___ Ownership: STATE_____

Data to provide if available:

	1985	1986	1987	1988	1989	1990
date placed	7/15	7/2				
date collected	8/14	8/20				
NUMBER OF 0.3%	0	0				
MOTHS 0.03%	1	12				
TRAPPED 0.003%	1	10				
early larval	_____	13.2				
late larval	_____	4.6				
pupae	_____	7 MIN				
egg mass	_____	2.5				
ground defoliation	_____	MODERATE				
aerial defoliation	_____	LIGHT				

Fmt 1 Updating Rec Type changes & F1 to Update. (F11 Omits) FES 2.01

FLOWER ABUNDANCE = MODERATE . YEAR OF OUTBREAK: 1985

JACK PINE BUDWORM PHEROMONE TRAPPING

Cooperator: HEYD/LAIN_ State: MI District: BARAGA_____ Plot Number: 16
Timber Type: __J6_____ Township: T49N_ Range: R34W_ Section: 21 Forty: ____
County: BARAGA_____ Location: _____
Compartment: 12___ Stand: 40___ Ownership: STATE_____

Data to provide if available:

	1985	1986	1987	1988	1989	1990
date placed	7/15	7/2				
date collected	8/14	8/20				
NUMBER OF 0.3%	0	5				
MOTHS 0.03%	1	2				
TRAPPED 0.003%	0	2				
early larval	_____	12				
late larval	_____	4				
pupae	_____	6 MIN				
egg mass	_____	0.7				
ground defoliation	_____	LIGHT				
aerial defoliation	_____	LIGHT				

Fmt 1 Updating Rec Type changes & F1 to Update. (F11 Omits) FES 2.01

FLOWER ABUNDANCE - MODERATE

YEAR OF OUTBREAK: 1985

JACK PINE BUDWORM PHEREMONE TRAPPING

oo rator: HEYD State: MI District: NEWBERRY Plot Number: 1
mb Type: J6 Township: T49N Range: R10W Section: 13 Forty:
ounty: LUCE Location: SW OF C0412 AND C0410 INTERSECTION
ompartment: 30 Stand: 13 Ownership: STATE

ta to provide if available:

		1985	1986	1987	1988	1989	1990
te placed		7/15	7/8	"	"	"	"
te collected		8/14	8/12	"	"	"	"
UMBER OF	0.3%	0	2	"	"	"	"
THS	0.03%	3	1	"	"	"	"
APPED	0.003%	0	4/3	"	"	"	"
rly larval			0	"	"	"	"
te larval			0	"	"	"	"
pae			1	"	"	"	"
g mass			0	"	"	"	"
ound defoliation			NONE	"	"	"	"
rial defoliation			LIGHT	"	"	"	"

operator: State: MI District: NEWBERRY Plot Number: 2
imber Type: J5 Township: T49N Range: R10W Section: 30 Forty:
ounty: LUCE Location: APP. 1/2 MI. W OF C0407, JUST S OF C0406
ompartment: 19 Stand: 55 Ownership: STATE

ta to provide if available:

		1985	1986	1987	1988	1989	1990
te placed		7/15	7/8	"	"	"	"
te collected		8/14	8/12	"	"	"	"
UMBER OF	0.3%	4	7	"	"	"	"
THS	0.03%	2	2	"	"	"	"
APPED	0.003%	4	8	"	"	"	"
rly larval			0.2	"	"	"	"
te larval			0.4	"	"	"	"
pae			1	"	"	"	"
g mass			0	"	"	"	"
ound defoliation			NONE	"	"	"	"
rial defoliation			LIGHT	"	"	"	"

JACK PINE BUDWORM PHEREMONE TRAPPING

Cooperator: HEYD State: MI District: NEWBERRY Plot Number: 3
Timber Type: J6 Township: T49N Range: R6W Section: 19 Forty:
County: LUCE Location: S OF POWERLINE ROAD OFF SOUTH STATION RD
Compartment: 65 Stand: 19 Ownership: STATE

Data to provide if available:

		1985	1986	1987	1988	1989	1990
Date placed		7/15	7/8	"	"	"	"
Date collected		8/14	8/12	"	"	"	"
NUMBER OF	0.3%	0	4	"	"	"	"
MOTHS	0.03%	1	2	"	"	"	"
TRAPPED	0.003%	1	3	"	"	"	"
Early larval			8	"	"	"	"
Late larval			0.6	"	"	"	"
Pupae			35 min	"	"	"	"
Egg mass			0.2	"	"	"	"
Ground defoliation			LIGHT	"	"	"	"
Aerial defoliation			LIGHT	"	"	"	"

Cooperator: State: MI District: SHIGLETON Plot Number: 4
Timber Type: J6 Township: T47N Range: R14W Section: 26 Forty:
County: SCHOOLCRAFT Location: WEST OF SUNKEN LAKE RD
Compartment: 126 Stand: 19 Ownership: STATE

Data to provide if available:

		1985	1986 dr	1987	1988	1989	1990
Date placed		7/15	7/13	"	"	"	"
Date collected		8/14	8/12	"	"	"	"
NUMBER OF	0.3%	1	5	"	"	"	"
MOTHS	0.03%	3	0	"	"	"	"
TRAPPED	0.003%	0	8	"	"	"	"
Early larval			12	"	"	"	"
Late larval			1.2	"	"	"	"
Pupae			30 min	"	"	"	"
Egg mass			0.3	"	"	"	"
Ground defoliation			LIGHT	"	"	"	"
Aerial defoliation			LIGHT	"	"	"	"

25 pupae / x min

JACK PINE BUDWORM PHEREMONE TRAPPING

oo rator: HEYD State: MI District: SHIGLETON Plot Number: 5
m Type: J5 Township: T46N Range: R14W Section: 10 Forty:
ounty: SCHOOLCRAFT Location: 1/2 MILE WEST OF CAMPGROUND
ompartment: 123 Stand: 23 Ownership: STATE

ta to provide if available:

		1985	1986	1987	1988	1989	1990
te placed		7/15	7/7	"	"	"	"
te collected		8/14	8/19	"	"	"	"
MBER OF	0.3%	0	2	"	"	"	"
THS	0.03%	2	1	"	"	"	"
APPED	0.003%	2	2	"	"	"	"
rly larval			13.6	"	"	"	"
te larval			0.4	"	"	"	"
pae			20min	"	"	"	"
g mass			0.2	"	"	"	"
ound defoliation			LIGHT	"	"	"	"
rial defoliation			LIGHT	"	"	"	"

operator: State: MI District: SHINGLETON Plot Number: 6
mber Type: J6 Township: T46N Range: R14W Section: 31 Forty:
unty: SCHOOLCRAFT Location:
ompartment: 123 Stand: 37 Ownership:

ta to provide if available:

		1985	1986	1987	1988	1989	1990
te placed		7/15	7/7	"	"	"	"
te collected		8/14	8/19	"	"	"	"
MBER OF	0.3%	0	6	"	"	"	"
THS	0.03%	0	1	"	"	"	"
APPED	0.003%	2	6	"	"	"	"
rly larval			12.3	"	"	"	"
te larval			0.9	"	"	"	"
pae			2	"	"	"	"
g mass			0	"	"	"	"
ound defoliation			LIGHT	"	"	"	"
rial defoliation			LIGHT	"	"	"	"

JACK PINE BUDWORM PHEREMONE TRAPPING

operator: HEYD State: MI District: SHINGLETON Plot Number: 7
mber Type: J6 Township: T44N Range: R15W Section: 26 Forty:
ounty: SCHOOLCRAFT Location: WEST OF HIGHWATER TRUCK TRAIL
ompartment: 32 Stand: 12 Ownership: STATE

ta to provide if available:

		1985	1986	1987	1988	1989	1990
te placed		7/15	7/7	"	"	"	"
te collected		8/14	8/19	"	"	"	"
UMBER OF	0.3%	0	2	"	"	"	"
THS	0.03%	0	0	"	"	"	"
APPED	0.003%	3	1	"	"	"	"
rly larval			10.3	"	"	"	"
te larval			0.1	"	"	"	"
pae			1.3	"	"	"	"
g mass			0	"	"	"	"
ound defoliation			LIGHT	"	"	"	"
rial defoliation			LIGHT	"	"	"	"

operator: State: MI District: SHINGLETON Plot Number: 8
mber Type: J6 Township: T44N Range: R15W Section: 26 Forty:
ounty: SCHOOLCRAFT Location: EAST OF HIGHWATER TRUCK TRAIL
ompartment: 32 Stand: 6 Ownership: STATE

ta to provide if available:

		1985	1986	1987	1988	1989	1990
te placed		7/15	7/7	"	"	"	"
te collected		8/14	8/19	"	"	"	"
UMBER OF	0.3%	0	1	"	"	"	"
THS	0.03%	0	1	"	"	"	"
APPED	0.003%	1	1	"	"	"	"
rly larval			6.7	"	"	"	"
te larval			0.1	"	"	"	"
pae			0.7	"	"	"	"
g mass			0	"	"	"	"
ound defoliation			LIGHT	"	"	"	"
rial defoliation			LIGHT	"	"	"	"

JACK PINE BUDWORM PHEREMONE TRAPPING

oo erator: HEYD State: MI District: SHINGLETON Plot Number: 9
imber Type: J5 Township: T46N Range: R16W Section: 28 Forty:
ounty: SCHOOLCRAFT Location: NORTH OF M28
ompartment: 157 Stand: 61 Ownership: STATE

ata to provide if available:

	1985	1986	1987	1988	1989	1990
ate placed	7/15	7/7	"	"	"	"
ate collected	8/14	8/19	"	"	"	"
UMBER OF 0.3%	0	2	"	"	"	"
OTHS 0.03%	4	2	"	"	"	"
RAPPED 0.003%	3	1	"	"	"	"
arly larval		3.3	"	"	"	"
ate larval		0.7	"	"	"	"
upae		0.3	"	"	"	"
gg mass		0	"	"	"	"
round defoliation		NONE	"	"	"	"
erial defoliation		LIGHT	"	"	"	"

ooperator: State: MI District: GWINN Plot Number: 10
imber Type: J5 Township: T46N Range: R25W Section: 15 Forty:
ounty: MARQUETTE Location: WEST OF CO553
ompartment: 75 Stand: 10 Ownership: MARQUETTE COUNTY

ata to provide if available:

	1985	1986	1987	1988	1989	1990
ate placed	7/15	7/3	"	"	"	"
ate collected	8/14	8/21	"	"	"	"
UMBER OF 0.3%	0	50	"	"	"	"
OTHS 0.03%	1	15	"	"	"	"
RAPPED 0.003%	0	11	"	"	"	"
arly larval		2	"	"	"	"
ate larval		0.4	"	"	"	"
upae		1	"	"	"	"
gg mass		0	"	"	"	"
round defoliation		LIGHT	"	"	"	"
erial defoliation		LIGHT	"	"	"	"

JACK PINE BUDWORM PHEREMONE TRAPPING

oc rator: HEYD State: MI District: GWINN Plot Number: 11
im Type: J5 Township: T46N Range: R25W Section: 29 Forty:
ounty: MARQUETTE Location:
ompartment: 79 Stand: 21 Ownership: STATE

ata to provide if available:

	1985	1986	1987	1988	1989	1990
ate placed	7/15	7/3	"	"	"	"
ate collected	8/14	8/21	"	"	"	"
UMBER OF 0.3%	0	1	"	"	"	"
OTHS 0.03%	1	0	"	"	"	"
RAPPED 0.003%	2	0	"	"	"	"
arly larval		0.3	"	"	"	"
ate larval		0.1	"	"	"	"
upae		0	"	"	"	"
gg mass		0	"	"	"	"
round defoliation		NONE	"	"	"	"
erial defoliation		LIGHT	"	"	"	"

ooperator: State: MI District: ISHPEMING Plot Number: 12
imber Type: J5 Township: T45N Range: R28W Section: 3 Forty:
ounty: MARQUETTE Location: NOTRH OF FLAT ROCK ROAD
ompartment: 29 Stand: 14 Ownership: STATE

ata to provide if available:

	1985	1986	1987	1988	1989	1990
ate placed	7/15	7/3	"	"	"	"
ate collected	8/14	8/21	"	"	"	"
UMBER OF 0.3%	0	20	"	"	"	"
OTHS 0.03%	4	5	"	"	"	"
RAPPED 0.003%	4	8	"	"	"	"
arly larval		2.3	"	"	"	"
ate larval		1.2	"	"	"	"
upae		1	"	"	"	"
gg mass		0	"	"	"	"
round defoliation		LIGHT	"	"	"	"
erial defoliation		LIGHT	"	"	"	"

JACK PINE BUDWORM PHEREMONE TRAPPING

oo rator: HEYD State: MI District: ISHPEMING Plot Number: 13
im Type: J6 Township: T46N Range: R29W Section: 27 Forty:
ounty: MARQUETTE Location: ROAD CONNECTING PEACH LAKE & CASEY LAKE
ompartment: 25 Stand: 9 Ownership: STATE

ata to provide if available:

	1985	1986	1987	1988	1989	1990
ate placed	7/15	7/3	"	"	"	"
ate collected	8/14	8/21	"	"	"	"
UMBER OF 0.3%	0	6	"	"	"	"
OTHS 0.03%	0	0	"	"	"	"
RAPPED 0.003%	0	1	"	"	"	"
arly larval		0	"	"	"	"
ate larval		0.1	"	"	"	"
upae		0	"	"	"	"
gg mass		0	"	"	"	"
round defoliation		LIGHT	"	"	"	"
erial defoliation		LIGHT	"	"	"	"

ooperator: State: MI District: ISHPEMING Plot Number: 14
imber Type: J6 Township: T50N Range: R29W Section: 18 Forty:
ounty: MARQUETTE Location: EAST OF YELLOWDOG ROAD
ompartment: 6 Stand: 13 Ownership: STATE

ata to provide if available:

	1985	1986	1987	1988	1989	1990
ate placed	7/15	7/2	"	"	"	"
ate collected	8/14	8/21	"	"	"	"
UMBER OF 0.3%	5	0	"	"	"	"
OTHS 0.03%	5	0	"	"	"	"
RAPPED 0.003%	19	0	"	"	"	"
arly larval		0.7	"	"	"	"
ate larval		0.2	"	"	"	"
upae		0	"	"	"	"
gg mass		0	"	"	"	"
round defoliation		NONE	"	"	"	"
erial defoliation		LIGHT	"	"	"	"

JACK PINE BUDWORM PHEREMONE TRAPPING

or ·ator: HEYD State: MI District: BARAGA Plot Number: 15
mb. Type: J6 Township: T49N Range: R34W Section: 17 Forty:
unty: BARAGA Location: W OF PRISON CAMP ROAD & PLAINS ROAD
mpartment: 8 Stand: 27 Ownership: STATE

ta to provide if available:

		1985	1986	1987	1988	1989	1990
te placed		7/15	7/2	"	"	"	"
te collected		8/14	8/20	"	"	"	"
UMBER OF	0.3%	0	11	"	"	"	"
THS	0.03%	1	12	"	"	"	"
APPED	0.003%	1	10	"	"	"	"
rly larval			13.3	"	"	"	"
te larval			4.6	"	"	"	"
pae			7 min	"	"	"	"
g mass			2.5	"	"	"	"
ound defoliation			MOD	"	"	"	"
rial defoliation			LIGHT	"	"	"	"

operator: State: MI District: BARAGA Plot Number: 16
mber Type: J6 Township: T49N Range: R34W Section: 31 Forty:
unty: BARAGA Location:
mpartment: 12 Stand: 40 Ownership: STATE

ta to provide if available:

		1985	1986	1987	1988	1989	1990
te placed		7/15	7/2	"	"	"	"
te collected		8/14	8/20	"	"	"	"
UMBER OF	0.3%	0	5	"	"	"	"
THS	0.03%	1	2	"	"	"	"
APPED	0.003%	0	2	"	"	"	"
rly larval			12	"	"	"	"
te larval			4	"	"	"	"
pae			6 min	"	"	"	"
g mass			0.7	"	"	"	"
ound defoliation			LIGHT	"	"	"	"
rial defoliation			LIGHT	"	"	"	"

United States Department of Agriculture | Forest Service | Northeastern Area State and Private Forestry | 1992 Folwell Avenue St. Paul, MN 55108

Reply to: 3410

Date: May 29, 1986

Dr. Robert L. Heyd
Forest Management Division
Michigan Dept. of Natural Resources
Region Headquarters Box 190
Marquette, MI 49855

Dear Bob:

Enclosed are ~~54~~ 48 jack pine budworm pheromone lures; 16 each of 0.3, 0.03, and 0.003 concentration. Also, included are 54 Vapona insecticide strips. The instructions note in item #2 that the lures should be handled with plastic gloves or forceps.

Recently, the information from last years pheromone trapping was entered into a computer data base file. Enclosed are copies of the data base templates entered for the sixteen plots (stands). Each sheet contains the information entered for two plots. The copies of the data base templates are for recording your results. Using these as data forms will ease entering future years data into the data base. Also, each spring you will receive new forms showing the past results and blank lines where the new information should be recorded. Please use these forms and send a photocopy of the completed forms to the St. Paul F.O. by October 14, 1986.

If we can be of further assistance, please let us know.

Sincerely,

Bill Jackson

WILLAM A JACKSON
Forestry Tecnician
Forest Pest Management

Enclosures

cc:
W. Jackson, SPFO
Dan Mosher, MI
FPM, Broomall

☆ U.S. Government Printing Office: 1981—351-522

U.S. DEPARTMENT OF AGRICULTURE

SPEED MEMO

PART NUMBER	DATE
1	5-29-86

Dr. Robert L. Heyd
Forest Management Division, DNR
Region Headquarter Box 190
Marquette, MI 49855

SUBJECT 3410

Jack pine budworm (JPBW) pheromone trapping [Focus Funding]

FROM
William Jackson
NA S:PF
1992 Folwell Avenue
St. Paul, MN 55108

MESSAGE (*WRITE CONCISE MESSAGE SIGN AND FORWARD PARTS 1 AND 3 TO ADDRESSEE RETAIN PART 2.*)

We have received a message that the $7,000 was allocated to you for the JPBW traps. I have enough JPBW pheromone for 16 plots (stands). You will have to order 48 traps (2 cases) from Great Lakes IPM, 10220 Church RD., NE; Vestaburg, MI 48891 (517-268-5693). The Vaportape II insectacdal strips come in pouches of 50 strips and can be ordered from: Hercon Laboratories Corp. Attn: Dr. Quisumburg, 200 B. Corp. Court, South Plainview, NJ 07080 & The cost for the Hercon Vaportape II will be ≃ $50.00 and the total cost for the ~~##~~ 48 Multi-pher 1 spruce budworm traps will be ≃ $278.40.

If you have any questions please call 612-642-5324. Bob Ford will be mailing some more information in the near furture.

PS: Hercon phone #: 201-755-7730

SIGNATURE
Bill Jackson

REPLY (*USE THIS SPACE FOR REPLY. SIGN AND DATE. RETURN PART 3 TO SENDER. RETAIN PART 1.*)

SIGNATURE	DATE

JACK PINE BUDWORM

PHEROMONE TRAP DATA 1983

Data collected by the Michigan Department of Natural Resources (Regional Headquarters, Marquette, Michigan). Trapper; Irene M. Borak. Supervisor; Robert Heyd, Entomologist, MDNR.

PLOT #	LOCATION	# MOTHS / CONCENTRATION .003	.03	.3
1	N. Luce Co., Comp. 30 T49N R10W S13 Std. 13	0	3	0
2	N. Luce Co., Comp 19 T49N R10W S30 Std. 55	4	2	4
3	Cen. Luce Co., Comp 82 T47N R9W S20 Std. 19	1	1	0
4	Schoolcraft Co., Comp. 126 T47N R14W S26 Std. 19	0	3	1
5	N. Schoolcraft Co., Comp. 123 T46N R14W S10 Std. 23	2	2	0
6	N. Schoolcraft Co., Comp. 123 T46N R14W S13 Std. 37	2	0	0
7	S. Schoolcraft Co., Comp. 32 T44N R15W S26 Std. 12	3	0	0
8	S. Schoolcraft Co., Comp. 32 T44N R15W S26 Std. 6	1	0	0
9	N. Schoolcraft Co., Comp. 157 T46N R16W S28 Std. 61	3	4	0
10	S.E. Marquette Co., Comp. 75 T46N R25W S15 Std. 10	0	1	0
11	S.E. Marquette Co., Comp. 79 T46N R25W S29 Std. 21	2	1	0
12	S.W. Marquette Co., Comp. 29 T45N R28W S3 Std. 14	4	4	0
13	S.W. Marquette Co., Comp. ? T46N R28W S27 Std. ?	0	0	0
14	N. Marquette Co., Comp. 6 T50N R29W S18 Std. 13	19	5	5
15	W. Baraga Co., Comp. 8 T49N R34W S17 Std. 27	1	1	0
16	W. Baraga Co., Comp. 12 T49N R34W S31 Std. 40	0	1	0

Irene M. Borak
MI D.N.R.
1990 US 41 South
Marquette, MI 49855
August 23, 1985

Robert B. Ford, Entomologist
Forest Pest Management
U.S.D.A. Forest Service
Northeastern Area S & PF
1992 Folwell Avenue
St. Paul, MN 55108

Robert Ford,

Enclosed are the Jack Pine Budworm moth counts attained using the 48 pheromone lures and Multi-pher traps sent to us. The traps were set as the directions indicated, and all were used in state owned jack pine stands. All were set out on the 15 and 16th of July and collected on the 13 and 14th of August. (A high percentage of the pupation occured in the second week of July.)

The results of the trapping seem quite erratic, however, we hope they will be of use to you. Thank you for all you have done for this project.

Sincerely,

Irene M. Borak

Enclosure